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Engineering Library

Telephone Engineer

A MONTHLY SERVING ENTIRE TELEPHONE INDUSTRY

30-DAY LIFE FOR READERS AND ADVERTISERS

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What They Say About Your Business

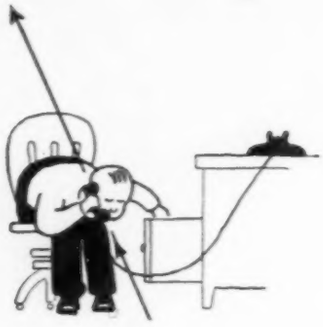
Infrequent interruptions, through storm or mechanical trouble, in the telephone service serves as a reminder of the way in which this system of communication has been wrought into the very fibre and substance of modern life. It is one of those great conveniences, or blessings, which are taken for granted and little appreciated.

In one sense it is a striking tribute to the excellence of telephone service that people feel so lost and bewildered when it is broken off suddenly. Such accidents are rare. And as the years pass they become rarer. The loss of it means not delay and discomfort, but often may mean a peril to life or property.

A whole generation has grown up to which the telephone appears indispensable. It is accepted almost as if it were a gift of nature. Only when something goes wrong with it, does one stop to realize that it is the result of inventive skill and the application of vast capital.

—Rensselaer (N.Y.) Transcript

YOU *Can't*



KELLOGG SWITCHBOARD & SUPPLY CO., CHICA

...and where is the little pea?

Buying telephone batteries is sometimes very much like the old shell game. Just as the player must choose the shell which covers the little pea, so must the telephone manager select the battery which will give him the most energy per dollar.

It's easy to be fooled in both games. It's easy to be tempted into thinking that the little pea is under *that* shell. But the foxy old operator shows you you're wrong—and you lose your money. And in the case of battery-buying, it's easy to think that the lower-priced battery gives you the most power for your money. But an accurate operating test will prove you're wrong—and the company loses money.

The old shell game has about passed out of existence, so we won't attempt to tell you how to select the shell which covers the pea. But we *will* be glad to show you how to select the most economical battery.

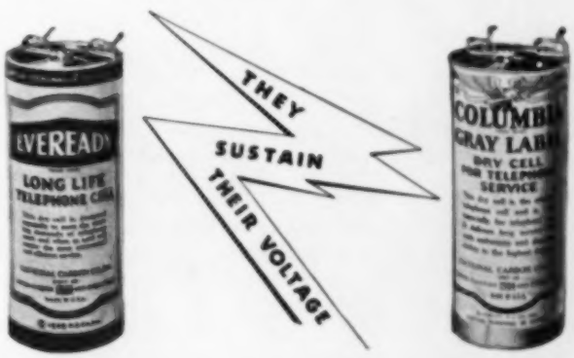
Take a look at the chart. Three dry cells are listed: the Eveready Long Life, The Columbia Gray Label, and the cell which proved third-best according to cost and service life . . . we call it cell C.

Make of Cell	Purchase Cost Per Cell	Multiplying Factor to Give True Cost (K	$\frac{365}{\text{Serv. Life}} = K$	True Purchase Cost Per Cell Required Per Year	Repl. Cost Per Cell Per Year	Total True Cost Per Cell Required Per Year
EVEREADY LONG LIFE	28.5¢	.91	$\frac{365}{400}$	25.94¢	22.7¢	48.64¢
COLUMBIA GRAY LABEL	25.0¢	1.106	$\frac{365}{330}$	27.65¢	27.7¢	55.35¢
CELL C	20.0¢	1.76	$\frac{365}{207}$	35.20¢	44.0¢	79.20¢

NOTE: *Replacement cost based on 50¢ per pair of cells or 25¢ per cell; this includes labor and car and is very conservative.* Please note that the days of life reported on this schedule are those of laboratory tests and are not comparable with actual operating days of service in that the test specifications are almost double practical application.

You can see that the true cost per year of the Eveready Long Life is lower than either of the other two batteries, even though its initial purchasing price is higher than the other two. Try this test in your own laboratory and use your own figures—and you'll find that the Eveready Long Life will show the same lead over all other batteries.

Don't be fooled by low *initial* cost batteries. Buy those which give you the lowest *true* cost for good transmission—which means buy Eveready Long Life or Columbia Gray Label Telephone Batteries. National Carbon Company, Inc., General Offices: New York, N. Y. Branches: Chicago, San Francisco. Unit of Union Carbide UCC and Carbon Corporation.



A Program of Progressive Development In Radio-Telephone Communication

Featuring The Engineering And Installation Of Radio Telephone Links In Western Canada, South America And The Philippines By Automatic Electric Company's Radio Engineering Staff.

WITH the assistance of the Associated Telephone Group staff and fortified by highly trained personnel and by years of accumulated experience in radio engineering, Automatic Electric Company is steadily expanding its staff and facilities for the engineering and installation of radio-telephone links—both in local channels, to supplement the land lines of local telephone companies, and in the establishment of cooperative connections with international radio-telephone organizations.

In the short space of three years, Automatic Electric Company and affiliated companies have designed, engineered and assisted in placing in operation the radio-telephone links shown in the accompanying map, while a number of others are either in progress or shortly to be initiated. The usefulness and efficiency of such radio channels, especially in places where rugged mountain ranges present formidable barriers to the construction of land lines, are becoming more apparent as the years pass.

Telephone operating organizations interested in establishing radio-telephone connections within their own borders or with operating organizations in other countries are invited to consult with our engineers, whose technical resources and broad experience are at their service.

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EDITORIAL

Facts and Theory and Investigations

We hold no animosity for investigators of the telephone industry. In fact, we welcome inquiries into the telephone business, provided they are fairly and practically conducted, and, provided the industry is not made a football for the benefit of some of our unscrupulous and publicity seeking politicians.

We are firmly convinced the Federal Communications Commission is sincere in its effort to conduct a fair and practical investigation of our industry, but in making the investigation we would warn the Commission to study and consider a few salient facts or it might do more harm than could be repaired in many years to come.

First, the Commission must preserve the high standard telephone service this country has enjoyed and is enjoying today. There must be nothing done to jeopardize the past progress that has given this nation the best telephone service in the world. No acts must be committed to impair or hamper future progress that will give the American public still better telephone service.

In the second place, the Commission must consider that in dealing with the telephone industry it is not dealing with the average sized business but is coming into contact with an enterprise having far-reaching influence in the welfare of this country and when it commits an act effecting the telephone business it is responsible to millions of citizens who benefit by the millions of dollars expended by the industry.

This is a big responsibility for any government agency. The FCC can realize its responsibility when it considers that in the year 1934, the telephone operating industry employed in the neighborhood of 300,000 men and women; paid in salaries and wages approximately $408,000,000; paid out in taxes something like $97,000,000 and issued in dividends approximately $184,000,000 to about 800,000 stockholders.

It can be seen that 1,100,000 men and women were effected directly to the extent of $592,000,000, to say nothing of those effected indirectly by the $97,000,000 tax moneys and those manufacturers and their employes who depend on the telephone operating unit for their livelihood. It might be well to bring out that the telephone industry is not owned by multi-millionaires or international bankers. It is owned by more than three-quarters of a million stockholders among whom are telephone employes, school teachers, doctors, lawyers, farmers, churches, hospitals, schools and colleges, insurance companies, institutional homes, etc., whose average holdings are small and who have found that their savings are more secure invested in the telephone business than in savings banks. That alone is a fine tribute to the sound and efficient management of the telephone industry.

We repeat that we recognize the need for government regulation and welcome an occasional investigation, but the telephone industry and the public do demand and, rightly so, such regulation and investigation be practical and not theoretical. We feel certain the FCC recognizes its great responsibility in its inquiry into the telephone business and that it will consider the cold facts and not rely on theory alone (as have most government agencies in the past) in dealing with the telephone industry.

R. C. Reno

EDITOR

Telephone Facts —

- Best of Service
- Big Employment
- Big Payroll
- Enormous Taxes
- Safe Investment

As We See It . . . .

Study the Index The primary purpose of an index to a publication like TELEPHONE ENGINEER is to provide a means of locating a desired article without the necessity of turning to the tables of contents of individual issues. It is a convenience that everyone who has occasion to refer to back numbers appreciates.

We believe there is another use of the index that is not always made. If the reader will turn to the index of the 1934 volume which appears in this number and will read it over, we are certain he will be bringing out some of the numbers of the journal for the past year for re-reading of certain articles, for reading of others which were laid aside for lack of time and for reading of some articles which did not appear to be particularly applicable then but which now have taken a new interest because something has come up that makes them timely.

The Reward of 1935 It was said that 1934 would reward fighters. That made a red hot slogan. For this year how about "1935 will reward survivors"?

Those who survived 1934 are in fighting trim. Every faculty is keenly trained. The worst has been passed. It taught many costly and valuable lessons that will be applied in making this year a great one for the survivors in the telephone industry.

You Need Your State Conventions This year opens strong with state telephone conventions. Judging by the plans for programs of these affairs it is evident that the telephone man who doesn't attend is going to be out some money.

But all the good of a convention does not lie in the set program. Many a telephone man has attended a convention and received from the scores of friendly, informal group sessions, "inside" information that he could apply to his own property with great profit.

If a man can't make a living in 51 weeks, he has slim chances of making the grade in 52. So the idea that the time for convention attendance can't be spared is one that won't hold water.

There's A Job To Be Done For support of the statement we have made many times that the telephone industry has not yet scratched the surface as far as saturation of the market for telephone service is concerned, we have but to read the following bulletin from *Electronics*:

"In 1934 four and one-half million new radio sets were added to those already in use to bring the total for the nation up to 19,000,000. This is 8,000,000 more radios than there are home telephones."

This shows the results that can be obtained when there is concerted and unified sales effort expended by every unit of an industry. The telephone industry has a big sales job ahead of it. It's about time something is done to get it started.

Our Guest Editorial

From Cedar Falls (Iowa) Record

INCONSISTENT

A few days ago the President announced over the radio he would like to co-operate with business leaders and bankers in trying to restore confidence and air recovery by national methods rather than by visionary and impractical schemes hitherto employed by the present government.

That was cheerfully accepted as good news. At once a feeling of relief was evident throughout the country. This feeling was of short duration, however, for on the next day one of the numerous government bureaus publicly announced a thorough investigation of the American Telephone and Telegraph company is planned.

Immediately following this announcement more than 600,000 owners of the telephone and telegraph company experienced a property reduction of 90 million dollars. If that be recovery, then the country has not much to look forward to under the Roosevelt administration. The methods may be humorous to some, but to another large group they are nothing but tragedy. The government has not yet learned to leave well enough alone. The United States has the best telephone and telegraph service in the world. The people should be proud of it.

While no banners are being carried by this newspaper for the A. T. & T., it is interested in the spirit of fair play—in seeing that the gigantic monopoly is given a square deal under the so-called New Deal government. An investigation of a constructive nature where political animus is not the major motive, might be all right; but this is a time, if there ever was one, for men to build and not tear down. Everybody is for the "abundant life." All should be ready to stand consistently for those things will make it a reality.

MULTI-METER for the TELEPHONE Man

● It has had three years of hard daily usage in an active exchange. It is accurate. It is dependable. It covers fundamentals, therefore it will not grow obsolete.

By
D. H. TOWNSEND
Churchill County Tel. & Tel. System
Fallon, Nev.

RADIO, an industry years younger than the telephone, has advanced by leaps and bounds, not only in equipment but also in testing and servicing. You, perhaps have marvelled at how quickly the radio technician with but one instrument, can check through a complicated receiver and diagnosis the trouble — *he uses a Multi-Meter!* He knows modern equipment requires modern testing apparatus.

You, as exchange men or "Trouble Shooters" know that to *properly check* a simple magneto telephone, several instruments are needed: a Battery Tester; a Milliameter; an A. C. Voltmeter; an Output Meter and an Ohmmeter — the sum total of which amounts to many dollars.

In the exchange many other meters are needed. You require several D. C. Voltmeters; A. C. Voltmeters; D. C. Milliammeters; Condenser Meters; Inductance Meters; Ohmmeters, etc. You must have an ammeter to check storage battery charging rate and you hardly can get along without a rectifing type output meter. You cannot afford all this array of expensive equipment. You probably have but one instrument —your wire chief's voltmeter, and I'll gamble it has not been checked for accuracy since the exchange was installed!

You do more guessing than testing. You cannot tell whether the primary of a certain induction coil is eight-tenths of an ohm or two-ohms. You guess a certain heat coil is three-and-four-tenths-ohms as stated in the catalog. How do you know it is not 20-ohms and causing a line unbalance producing noise? Bill Smith's telephone is noisy and uses dry-cells fast—you have no milliammeter to check the current through the transmitter, you can only guess at just how well the set "talks up." Lord! How you have wished for an instrument like that radio technician's!

A New Telephone Multi Test Set

To satisfy that wish, that need of proper instruments to check your telephones, transmissions, etc., the MULTI-METER FOR THE TELEPHONE MAN was developed. It has had three years of hard daily usage in an active exchange. It is accurate! It is dependable! It covers fundamentals, therefore will not grow obsolete. Its design was worked out by telephone men, strictly for telephone service! In fact it is named a "Telephone Service Meter." It is made by one of the largest manufacturer of strictly precision resistors in the United States and is shown in Fig. 1.

The one instrument, a rectifying type meter (with self-contained rectifier) housed in a thick, handrubbed, hardwood carrying case 10" x 9⅝" x 5¾" covers the following items:

Voltage, either D. C. or A. C.—0-6; 0-30; 0-150 and 0-300 Volts. All 1,000 Ohms per Volt;

Direct Current—0-15; 0-150 and 0-300 Milliampers, and 0-6 Amperes. The resistances of the M. A. ranges being low enough not to effect transmitter circuits;

Output Meter—Same ranges as A. C. Volts, usable either with, or without the built-in artificial line and blocking condenser;

Ohm Meter—O-500; 0-5,000 and 0-50,000 Ohms. Also used as a continuity tester;

A. C. Resistance Meter—Covering up to Three-Megohms;

Inductance Meter—1 to 10,000-Henries;

Capacity Meter—.001 to 10-Mfds;

Dry Cell Tester—Bureau of Standards Test, adapted to one cell.

Power Level Indicator—Scale reading from Minus 6 to Plus 9 DB.

Fig. 2 shows the schematic wiring of the instrument, as viewed from the back when removed from the carrying case. Note only the "nominal" or approximate values of the various resistors are given. Here's why: No two meters or rectifiers have exactly the same characteristics—therefore to obtain the *extreme accuracy* required in telephone service, each meter must have its resistances matched to it. These resistances are the non-inductive, wire-wound type, and unlike carbon resistors, they will not change their values with age. Note the variable primary insulating transformer used when checking capacity, inductance and A. C. resistance. While the general run of meters are calibrated for 110-volts 60-cycle A. C. one seldom finds commercial power exactly 110-volts, it is more likely to be 115 to 120-volts, therefore to check a half; one or two mfd. condenser with telephone exactness this transformer is a necessity. It is also valuable in checking grounded capacity. The ohmmeter circuit is convential, a standard size, spring-clip telephone dry cell supplying the necessary voltage.

Convention Schedule

Minnesota Telephone Association, Hotel Lowry, St. Paul, January 29, 30 and 31.

Nebraska Telephone Association, Hotel Lincoln, February 13 and 14.

Iowa Independent Telephone Association, Hotel Fort Des Moines, Des Moines, February 26 and 27.

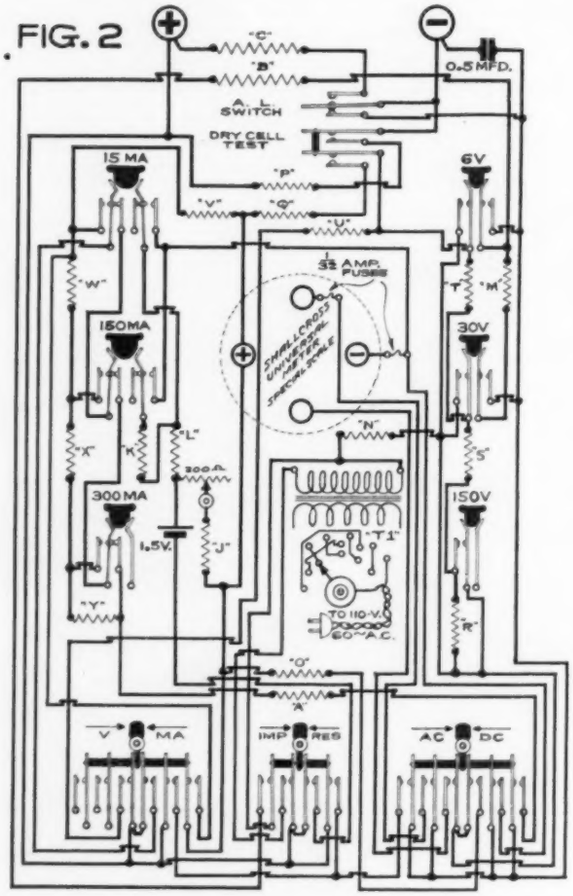
Wisconsin State Telephone Association, Park Hotel, Madison, March 5, 6 and 7.

The Texas Telephone Association, Dallas, March 25, 26 and 27.

Ohio Independent Telephone Association, Hotel Deshler-Wallick, Columbus, May 1 and 2.

Indiana Telephone Association, Claypool Hotel, Indianapolis, May 8 and 9.

FIG. 2



A PORTABLE MULTI-METER for the TELEPHONE MAN

Resistance Data

Code Type	Nominal Res. Value*
"A"—LR	—0.0101 Meg.
"B"—RM	—1,111
"C"—RM	—630
"J"—180	—1,300
"K"—180	—151.5
"L"—180	—15.15
"M"—190	—11,111
"N"—180	—105,000
"O"—180	—4,950
"P"—180	—6.67
"Q"—180	—450
"R"—180	—150,000
"S"—180	—120,000
"T"—180	—24,000
"U"—180	—1,000
"V"—180	—535.2
"W"—180	—4.30
"X"—180	—0.242
"Y"—180	—0.226

*Due to Variation of Meter and Rectifier Characteristics These Values will be Deviated From Slightly.

NO BUTTONS PRESSED

Range 6 A. D. C. 300-V. D. C. or A. C. As Case May Be.

D. H. Townsend—1934

Naturally in an instrument of this kind, even though amply protected by fuses, one must use care in operation, be sure that the switches are properly set and—*always* try the higher voltage and current ranges first! True also, one must learn to use the instrument. You had to learn to use a pair of "hooks" to climb a pole—and since you learned you would not pack a ladder—heck no, you would laugh at a man who required one. It is far simpler to learn to use the meter than the hooks. Let's try it out! Drive out to Bill Smith's and we will check that set!

First, test the battery. Open up the set, disconnect the dry cells. Set the bottom switches on the meter to "D. C." and "V.", the upper switch to "Dry Cell Test", connect the Plus Meter test lead to the Plus Post of one cell and the negative lead to the Negative Post of the cell, start checking time—What! The needle is moving rapidly to the left, it's down to 5V, 4V. It's hit the Red Mark! It's still going! Disconnect the meter and throw that cell away! That red mark is the cut-off point. Try a new cell, the need'e shows full scale or nearly so and stays there even after two minutes or more closure.

Put two fresh cells in the telephone, restore the meter switches to normal, then set them for "D.C." "M.A." con-

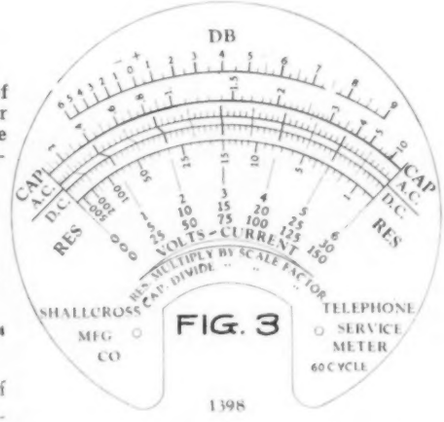


FIG. 3

necting the test leads for proper polarity in series with the cells and transmitter, remove the receiver from the switchhook—we are checking direct-current now. Hold down the 300-MA

(Please turn to page 32)

BASIC Telephone Electrical THEORY

● Part III of Mr. Burden's article dealing with basic theory of electrical engineering as applied to the telephone field discusses the difference between AC and DC circuits.

By
B. C. BURDEN
Transmission Engineer
Lincoln (Neb.) Tel. & Tel. Co.

III

AN ALTERNATING current cycle has been defined as a complete reversal of current or voltage starting from zero value, rising to maximum, falling back to zero, and repeating in the opposite direction. The number of cycles that occur in one second is known as **the frequency** of the alternating current wave under consideration.

For example, the usual power source used for residence lighting is 110 volt 60 cycle. If there are 60 complete cycles per second then the actual time required for one cycle to take place must be 1/60 of a second. It is customary to state frequency as "60 cycles" and not as "60 cycles per second". It is understood that the frequency in cycles per second is meant. In dealing with alternating current circuits it is often necessary to consider merely one half cycle; i. e., the change in current from zero to maximum and back to zero. This portion of a cycle is known as an **alternation.**

In dealing with direct current circuits and potentials we find that if we connect two courses of DC voltage in series so that the positive terminal of one source is connected to the negative terminal of the other source, that the voltages will add. Or if we connect the two sources so that the positive terminal of one source is connected to the positive terminal of the other source the voltages will oppose each other and the total voltage will be the difference of the two voltages. In the first case we would say that the voltages were **"in phase"** and in the second case that they are **"out of phase 180°".**

The term "phase" as used in alternating current work refers to the position in the cycle of either a voltage or current sine wave with reference to the starting point. It is used in the same sense as for DC circuits with the difference that in a DC circuit the voltage or current with respect to a given starting point (direction or flow) is either "in phase" (zero phase), or 180° out of phase. Whereas, in an AC circuit the voltage or current may be anything from zero to 360° out of phase with the starting point. Inasmuch as **phase** is usually spoken of in terms of angle, it is sometimes referred to as **phase angle.**

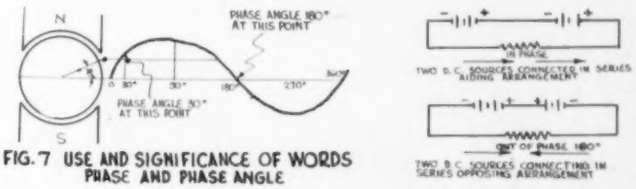

N
S
PHASE ANGLE 180° AT THIS POINT
PHASE ANGLE 90° AT THIS POINT
IN PHASE
TWO D.C. SOURCES CONNECTED IN SERIES AIDING ARRANGEMENT
OUT OF PHASE 180°
TWO D.C. SOURCES CONNECTING IN SERIES OPPOSING ARRANGEMENT

FIG. 7 USE AND SIGNIFICANCE OF WORDS PHASE AND PHASE ANGLE

It is quite important that the use and meaning of the term be understood as it is a much used word in AC theory and practice. Fig. 7 illustrates the use and significance of the term.

In considering the action of alternating current in circuits and apparatus it is necessary that we revise somewhat our notions of electrical resistance as set up in the direct current portion of this text. In direct current circuits the flow of current in a circuit was impeded by **only the ohmic resistance of the circuit** which was dependent upon the nature and size of the conductor. In alternating current circuits the flow of current in a circuit is impeded by not only the ohmic resistance, but also by what is known as **"reactance".** There are two kinds of reactance; viz, capacity reactance, and inductive reactance. Both offer a retarding effect to the flow of an alternating current. Let us first consider what inductive reactance is and how it acts.

Inductance reactance is an impeding or retarding effect offered to AC currents and which is inherent to conducting materials arranged in the form of a coil. It is due to a property known as **"inductance"** which only coiled conductors seem to have. It should be understood that inductance is an inherent property of coiled conductors, whereas inductive reactance is merely the retarding effect which an inductance offers to any **change on the value of the current passing through it.**

When an alternating current flows through a coil of wire a magnetic field is created around each turn of the coil. This field varies in strength and polarity in accordance with the periodic variations of the AC current creating it, and as a result the field surrounding one turn of the coil is constantly cutting through the adjacent turns, in much the same manner as the varying flux of one winding of a transformer cuts through the adjacent winding setting up a voltage therein. The effect of the flux of one turn cutting through the adjacent turn is to build up a voltage in that turn which is of opposite polarity to the

(*Please turn to page* 30)

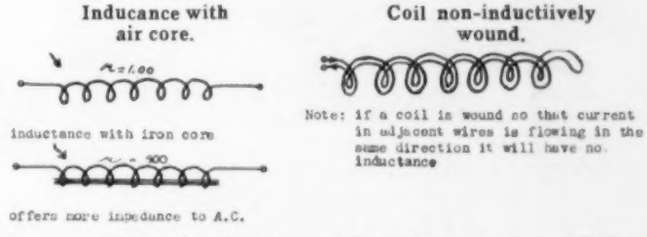

Inducance with air core.
Coil non-inductiively wound.
Inductance with iron core
offers more impedance to A.C.
Note: if a coil is wound so that current in adjacent wires is flowing in the same direction it will have no inductance

Fig. 8. Effect of inductance in an alternating current circuit.

Suspension of Illinois Depreciation Order Asked

In a petition filed with the Illinois Commerce Commission on December 19, the Illinois Valley Telephone Co., Streator, Ill., requests modification or suspension of the Commission's General Order No. 137, relative to the filing of information and data on depreciation.

Order No. 137 was issued July 27, 1934 and requires all class A telephone companies, whether under the jurisdiction of the Federal Communications Commission or not, to file depreciation rates, and supporting data, using the same forms of schedule and following the same rules and regulations applicable to filing of depreciation rates under Interstate Commerce Commission's order under docket 14700, issued July 28, 1931.

In determining the proper and adequate depreciation rate for companies not subject to the FCC, the Illinois Commission states that it will exercise its jurisdiction under Section 14 of the Illinois Commerce Act.

In its petition the Illinois Valley Telephone Co. sets forth that Order No. 137 should be set aside for the following reasons:

"(a) Said order proposes to fix rates or percentages applicant shall in the future apply to the ledger values of various classes of its telephone property for the purpose of arriving at a composite rate or percentage from which shall be derived an amount applicant shall include in its operating expenses for depreciation. The plan proposed to be used is that promulgated by Interstate Commerce Commission, which is adopted by Illinois Commerce Commission for this purpose. Being unable, of course, to know the future the Interstate Commerce Commission proposes that such percentages or rates shall be estimated, by estimating the service value and service lives of the various classes of property in question, using for such purpose a study of the company's history and experience and such engineering and other information as may be available with respect to future prospects. The result of said plan is to arrive at a composite rate based on system of averages obtained from a combination of records of the past and estimates of the future.

"Applicant submits that it would be only the most remote chance that such a plan could arrive at the actual cost to applicant of depreciation upon its property as a whole or any part of it and that, that being the case, applicant should not be required to assume the hazard involved. Applicant concedes that a figure can be arrived at by such a method, which figure could be used as a composite percentage for reaching an amount to be charged to operating expenses of a telephone company in lieu of and to take the place of the actual cost to such company of the depreciation of its property, but applicant points out that the percentage so arrived at and used would not be the actual depreciation of said property but would be merely the result of certain calculations used, with the permission or the approval of the regulatory body having jurisdiction, in the place of the cost of depreciation. Applicant concedes that a very large telephone company operating a large number of telephone properties might safely take the risk of using such an arbitrary percentage in the place of the real cost of depreciation because, in the case of such a large company, while the actual cost of depreciation might be more than agreed upon percentage in some places, it would doubtless be less in other places so that the proposition might average up satisfactorily over a large area. The amount of property operated by applicant is, however, too small and applicant's revenues are too small to allow it to take such a risk because if the amount resulting from such an arbitrary percentage should turn out to be less than the actual cost of depreciation of applicant's property, then applicant's property would be consumed in the service of the public without compensation and applicant might and no doubt would come to serious financial grief thereby; on the other hand, if such an arbitrary percentage resulted in an amount in excess of the actual cost of depreciation to applicant, injustice would thereby be done applicant's patrons; and applicant does not wish to take such advantage of its patrons.

"It will be observed that the order of the Interstate Commerce Commission dated July 28, 1931, as amended by the supplemental orders establishing a new system of accounts, does not deal with the question of the actual depreciation to be charged to expense, but provides a method of setting up a reserve and making provision that if and when, at some future time, property is retired, it shall be charged to this reserve. The Interstate Commerce Commission did not comply with the Act of Congress, but instead, merely provided that an admittedly estimated sum to be credited to reserve should be charged to expense, instead of providing that a reserve should be set up against which the true expense, when ascertained, should be charged. The charge to the company's expense should be made only as a result of the ascertainment of depreciation actually sustained. Prior to that time, the status of the monthly or annual credit to the reserve is, as has been pointed out by many economists and accountants, simply an appropriation to a reserve from gross profits or from surplus arising before creation of reserve for depreciation. Until the facts are ascertained, the reserve is merely an appropriation from surplus to provide for losses accrued and accruing, but the amount of which is not yet ascertained.

"(b) It is impossible to accurately calculate in advance the cost of depreciation on any part of a telephone plant. Depreciation occurs by reason primarily of three elements; Wear (sometimes also called wear and tear, deterioration, or decay), obsolescence and inadequacy. If it were possible, which it is not, to calculate in advance the cost of wear of plant and equipment (which would mean that it would be necessary to know in advance the exact service life of every item of plant, and the exact condition and salvage value of it when finally removed from plant), it would still be impossible to arrive in advance at the cost of obsolescence and inadequacy.

"Obsolescence arises from changes in and advancement of the art; these are beyond the control of any telephone management. Inadequacy arises from changes in the needs and demands of the public served; these are likewise beyond the control of any telephone management. These two items, undeterminable by any telephone management or by anyone in advance, constitute a large part of the cost of depreciation. That part of the cost of depreciation which arises from wear is diminished or increased according to the manner and degree of the maintenance of the property. But no amount of maintenance of plant in existence can

forestall or prevent the cost of retirement of parts, and often large parts, of the plan because improvements in the art have made them obsolete or changes in the needs of the subscribers have made them inadequate.

"The provision for obsolescence is in fact provision for progress, and progress—i.e. the constant improvement of the art—creates a constant destruction of the present values of telephone property. The development of the common battery switchboard destroyed a large part of the value of the countless magneto switchboards which had, through public demand, to be retired long before their period of usefulness had expired. The development of the automatic telephone likewise destroyed the value of and caused the retirement of many manual switchboards which otherwise would have remained in service years longer. The same condition exists throughout the whole telephone plant, as is instanced by the substitution of aerial cable for open wires, of underground for overhead construction, and so on. A current illustration is the rapid development during the past few years of entirely new types of telephone instruments, which new types are fast rendering obsolete hundreds of thousands of telephone standard in type only a few years ago. This destruction of present values of telephone property is constantly going on through the rapid development of the art—and who would have it otherwise? It is in keeping with the spirit, aims and ideals of America that the art of telephony should improve and advance as rapidly as inventive genius and manufacturing methods and facilities make that possible.

"The theory that the depreciation charges on any part of a telephone plant can be fixed at some certain rate or amount which will provide for all the exigencies of the future, is based upon the belief that some given average per year can be arrived at in advance which will, over a period of years, make full and adequate provision for all the company's future needs as to wear, obsolescence and inadequacy. This theory is untenable. While it is true that, given some specific policy as to maintenance, it might be possible to forecast within reasonable limits the percentages or amounts needed to provide against wear, it is utterly impossible to so provide in advance against the elements of obsolescence and inadequacy, since it is impossible to foresee at any time the amount or the particular parts of plant that will need to be replaced in any given period in the future because of changes in the art, or inadequacy. The future cost of obsolescence and inadequacy in an undeterminable today as the state of the weather a long time in the future.

The Farm Situation

Farming areas continue to be the bright spot in retail trade. Farmers have received larger income in the last three or four months than at any previous time in four years and have promptly converted it into merchandise.

The increase in farm income over last year or two years ago probably has been greater than in the income of any other important group in the population. In September and October, farmers received 19 per cent more cash than in the corresponding months last year and 72 per cent more than two years ago. . . . .

Larger income is enabling farmers to clean up their accumulated bills, which will leave more of their future income for new purchases. The Farm Credit Administration reports that its collections on farm loan installments during the year to October 1 increased 42 per cent over last year, although the amount becoming due increased only 8 per cent. Collections on installment purchases of farm equipment and other goods have increased as much as 50 per cent.—**The Agricultural Outlook.**

"(c) The plan of Interstate Commerce Commission to fix rates now to cover the future depreciation of telephone property is, on analysis, even more complex and absurd than the foregoing would indicate. Not content to require the telephone company to guess at one rate which, applied to the whole of its plant, would presumably provide, as a part of operating expenses, an amount to cover the cost of the depreciation of the whole property, that Commission divides the property into twelve different parts, and requires the telephone company to make twelve different guesses that is, to guess a rate that should apply to each of these twelve parts. These rates so arrived at are then applied to their respective portions of the plant, and from the whole a composite rate is reached which is applicable to the whole of the plant. Such is the manner, under the proposed plan, by which would be determined the rate of depreciation upon its property that the telephone company would be allowed to charge to its operating expenses, and upon which it would need to rely for the cost of perpetuating its property.

"The foregoing is, however, only a part of the complexities of the scheme. Under the plan of Interstate Commerce Commission the telephone company is not allowed even the privilege of offsetting one bad guess made by itself or by the Commission against another bad guess. On the contrary, the plan provides that each of these twelve separate parts of the plant shall have its own separate reserve for future depreciation. An unnecessary surplus arising in one of the twelve reserves because of the inability of either the company or the commission to read the future correctly cannot be transferred by the telephone company into another reserve where, because of the same lack of ability, a deficit may exist.

"Applicant submits that this scheme is so absurd as to border on the fantastic. It multiplies by twelve the impossibilities of this whole idea of predicting the future cost of depreciation. Who can have the prevision and the foresight to determine now or at any time just what part, and just how much of that part, of a telephone plant must be retired in the future, and when, and under what circumstances, because of wear, or obsolescence or inadequacy? What will be the next improvement in the art of telephony? When will it come, and when must it be adopted by a given company? What part of that company's then exisiting plant will it replace? How and when and where will the needs and demands of the the public served change, and to what extent, and what changes will that require in the then existing plant of any telephone company? How much shall the company allow in its guess for replacement of subscribers' sets because of developments of the art, for changes of poles, wires and cables because of inadequacy, for replacement of central office equipment because of obsolescence created by some development today unknown? Such questions could be extended indefinitely. They disclose the entire lack of practicality in this whole scheme of applying an unlimited amount of theory to a proposition that, like many other questions in any business, must in finality be dealt with on a common-sense, practical and business basis.

"(d) Depreciation charges for small areas and small owners should be flexible and adaptable to the changes, climatic, economic and social, that are taking place, or have taken place, within the community served. An intensely practical judgment must be brought to bear in setting aside the amount reserved for depreciation, based upon thorough consideration of the company's business and its recent experiences and operation, both physicial and financial.

"As applied to small owners and operators, this is decidely an extremely practical matter. Who can better judge of what the depreciation charges for a year should be than the officers

(*Please turn to page 26*)

LINE and DESK

Ray Blain, Member A. I. E. E., Editor

Q.—Please explain the best method of rebutting switchboard cords?

A.—There are several good methods of rebutting these cords and some prefer one and others another. We like best the methods of removing the outer braid of the conductor, piercing it with an awl and inserting the screw through the tinsel. This operation if carefully performed will give a cord that will last approximately as long as the factory job.

Q.—When underground dips are introduced into an aerial cable should this underground section be separated from the areal section by insulated splices?

A.—Present approved practice does not require insulated splices be placed at junction of aerial and underground cables unless made necessary for electrolysis reasons.

Q.—Is No. 19 twisted-pair inside house wire considered standard?

A.—This size house wire is generally used though No. 22 wire of the same type was recently placed on the market and is coming into generally use in some localities.

Q.—Why is the biasing spring necessary on a subscribers telephone bell?

A.—The ringer is generally biased to prevent tapping or false ringing and the biasing spring should be adjusted with just enough tension to obtain this result without affecting the proper ringing of the bell.

Q.—What type of tie is recommended to prevent cable from sliding through the rings when strung over hills?

A.—A hitch of lashing wire may be used but it is not recommended as it is apt to injure the sheath of the cable which will later cause trouble. The use of the standard grade clamp, which can be purchased at a reasonable cost is recommended.

Q.—Is the fanning-out of paper insulated cable on small house cable terminals considered satisfactory?

A.—This method is not generally considered good practice though it is used to some extent with very good results. In the old days paper insulated cables were sometimes fanned-out on main frames and some of these old installations are still giving good service. The approved practice with most telephone companies is to splice a short length of silk and cotton insulated cable to the paper insulated and the former used to fan-out on the cable terminal. It is believed that the new pulp insulated cable presents great possibilities for fanning-out direct on house terminals and even small main frames.

Q.—What methods are recommended for obtaining maximum life of cords on subscribers telephones?

A.—The life of the cord will depend to a great extent on the care taken by the subscriber. Present day cords are good and if properly used and necessary precautions taken to prevent injury to them they should give maximum service for a long period of time. Desk stand cords should, in all except special cases, be limited to a standard length of about five and one half feet. If the instrument is installed in a semi-damp location it should be equipped with weatherproof cords. All anchor or tie cords should be tied firmly in place to prevent strain from weakening or pulling-out the terminals.

Q.—What is meant by side tone reduction in a subscribers telephone?

A.—When the loop resistance from the main frame to the subscribers station is under about 90 ohms, considerable current passes through the transmitter which tends to cause side tone which is due to local noises varying the resistance of the transmitter and consequently affecting the current in the receiver circuit. To overcome this condition a change can be made in the instrument wiring which removes the transmitter from the local circuit. This change causes the loss of the booster effect of the circuit and is not recommended for long distance use or any line where the transmission is low. The manufacturer of your instrument will indicate the anti-side-tone hookup when considered necessary if the regular drawing in the instrument does not indicate this change. There has recently been developed a transmitter for use in noisy locations which eliminates the necessity of the anti-side-tone hookup and at the same time gives normal transmission. Personally we have always considered the anti-side-tone hookup only a makeshift and it usually causes more difficulties than it prevents.

Q.—Is concrete considered the best top protection for a conduit run?

A.—There is no doubt but that concrete is a good top protection for conduit but it has one disadvantage in that anyone digging and coming to a concrete slab will generally make an attempt to burst it out and in so doing will generally seriously damage conduit and cable. Creosoted plank is a good top protection and when it is located by anyone digging they will generally investigate and determine what it covers or protects. There is very little difference in the cost of concrete and planks in most localities and the plank properly creosoted will last almost indefinitely.

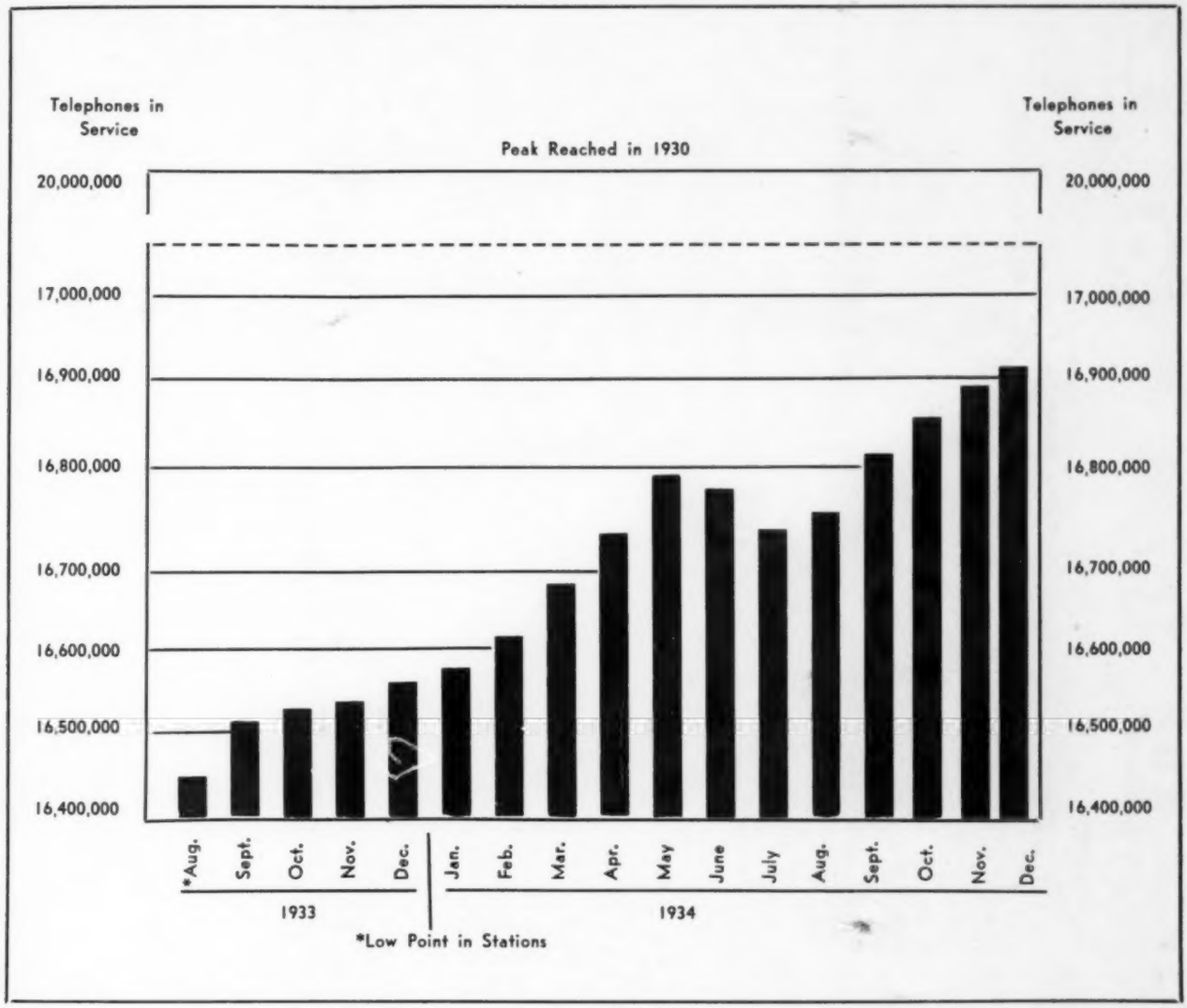
Q.—What is attenuation in a telephone circuit?

A.—The energy of the sound waves produced by the voice causes the diaphragm of the transmitter to move, thereby converting mechanical energy into electrical energy. The receiver then again converts electrical energy into mechanical energy. When the sound received at the receiving station is much lower in volume than the original spoken word it is quite evident that some of the energy must have been lost in transmitting it from one point to another. This loss of energy is commonly referred to as transmission loss and is made up of all the losses in the individual parts of the circuit. With a few exceptions, such as amplifiers, each piece of apparatus introduced into the talking circuit causes some transmission loss in the line itself. The loss in the line is known as the attenuation loss of attenuation of the line.

Q.—In what sequence should the cable pairs in a terminal be numbered?

A.—Pairs should always be counted from the left side down. That is the first pair on the top of the row of terminals and on the left should be pair No. 1 in the terminal. If there are twelve pairs in the first row then the first pair on the second row should be pair 13. The pairs should always be counted facing the cable terminal. A good rule to remember is that all horizontal terminal strips should number from the left to the right and all vertical ones from the top down.

Monthly Telephone Station Barometer



AS PREDICTED December produced a good gain in telephone stations, making the sixteenth consecutive month, with the exception of July and August, that an increase has been recorded. 1934 finished strong and converted the 1933 loss into a substantial gain.

The story told by the chart on this page should lend incentive to telephone operating men to increase their efforts to continue this remarkable progress. It should give them confidence to begin getting their plants in shape to take care of increased business by making needed replacements and repairs.

This definite and steady improvement in telephone stations should give manufacturers a brighter outlook for 1935 and lead them to expand their efforts to increase their business. All in all present indications point to a definite revival of the telephone industry and it is the duty of every division of the business to do its part to make this revival genuine and permanent.

"My telephone finds the highest prices"

"People who just take a load of chickens to town have to be satisfied with what they get for them," says a farmer near Medford, Oklahoma. Instead, he uses the telephone to find out where he can sell to best advantage.

This is another of the innumerable instances where the value of the telephone can be measured in dollars and cents. But it has also a value that cannot be measured in money — that of keeping the family in constant touch with friends and relatives. And its service is priceless in time of emergency —when fire, theft, illness, accident comes to your door or that of a neighbor.

BELL TELEPHONE SYSTEM

FARMERS WRITE THEIR OWN ADVERTISING FOR THE TELEPHONE

Advertising drawn directly from the lives of its readers is likely to be natural, believable. Telephone advertising in farm publications is really written by the farmers themselves. Actual instances of the telephone's usefulness, reported by rural subscribers, form the basis for each advertisement. • Some advertisements, like the one on the opposite page, show how the telephone can be profitably applied to the business of farming. Others are devoted to the human values of the telephone to farm families. • Simple, authentic advertising of this type, appearing month after month, should help to hold present farm subscribers and win new ones for telephone companies everywhere.

An Advertisement of the Bell Telephone System

Suspension of Depreciation Order Asked

(*Continued from page* 16)

and directors of the small company, who, at the end of the year, can review the year's operation and take note of the condition of the company's plant and the changes that have been taking place in that plant during the year and can consider the financial results of the year's operation? Certainly, some formula fixed academically far in advance to determine the amount of depreciation cannot be as satisfactory as a method which has that flexibility which would permit adjustments from time to time at short intervals as the operations of the particular property require.

"Depreciation for moderate-sized telephone properties can best be provided by making appropriate monthly charges to operating expense or as appropriations to surplus and corresponding credits to the depreciation reserve and at the end of the year adjusting the same, if necessary, after consideration of the company's actual experience as developed during the year and its added knowledge of its property and the changes that have taken place and are taking place therein.

"This company (and others of like size) is obliged to run its property on the basis of actual results experienced in the actual area and territory served for any given period, regardless of the theoretical estimates based on averages for relatively long periods as applied to large properties. To adopt theoretical estimates particularly for small properties would mean the probability that slight changes of the actual from the estimated average would bring the income statements for any year to a misleading result with the consequent upsetting of annual balance sheets, and adversely affecting finances.

"(e) Order 137 should be set aside because this Commission does not have the authority to fix percentages of depreciation and require them to be charged in the future conduct of a telephone company's business, particularly independent of rate hearings and the necessity therefor.

"This Commission through long years of its administration has never attempted to fix depreciation percentages for the future in the manner now attempted without relation to rates charged for service. The Commission has thus impliedly construed the statutes of this State as not granting to the Commission any such authority.

"The jurisdiction of this Commission over depreciation charges is and should be confined to estimates for use in rate cases when the particular property of a telephone company is under the scrutiny of the Commission, and the operating expenses, including depreciation charges, and the needed revenues of that property with which to defray these expenses may be considered at the same time. In fact there is good reason to believe that it is the intent of the Illinois Commerce Act that such should be the procedure, since the Legislature has by recent enactment practically so interpreted the statute by providing, in the amendment adopted to Paragraph 1 (chapter 111 (a) of the Revised Statutes of 1933, that in the investigation of rates the Commission must allow "reasonable deductions for depreciation". It is a fair assumption that by a "reasonable deduction" is meant one that is reasonable at the time the rates are investigated. If, therefore, the question of the reasonableness of the allowance for depreciation must be gone into by the Commission at the time of the investigating or fixing of rates, and must be determined at that time, what can be the value of theoretical rules for the fixing of depreciation rates to be used month by month in the company's accounts, when the same may or may not have resulted in a deduction for depreciation that is reasonable at the time rates are investigated or fixed, and since they must be examined into at that time to determine whether or not they are reasonable?

"To adopt and fix for the future by theoretical estimates the amount which must be set aside out of income for a depreciation reserve in one proceeding and to establish rates from which this income is derived in an entirely different proceeding is illogical and will result in grave injustice.

Revenues of the company necessarily have controlling influence on the ability of the company to provide depreciation reserves, and in fact some authorities suggest the use of revenues as a basis of calculating the amount for depreciation charges. In the Public Utilities Fortnightly of November 8, 1934, Mr. Luther R. Nash refers to this phase of the matter as follows:

"The use of revenue as a basis of percentage appropriations for retirements has been criticized by various commissions and others as being illogical. It is claimed that a percentage of physical property is more accurate, for the reasons that physical property continues to depreciate regardless of the amount of revenue derived therefrom. Such contention would be true if all property were retired because of physical deterioration.

'By far the major part of all retirements is, however, due to non-physical causes and it is not difficult to show that revenue has a most important bearing. If revenue increases rapidly owing to added volume of the business it may be necessary to provide new facilities and to abandon old units. Revenue is, therefore, a very close guide to inadequacy. Similarly, obsolescence depends upon revenue because without the surplus arising from increased revenues and general prosperity associated therewith improvements would not be made. Furthermore, supersession, including retirements, due to public demands, depends upon community prosperity which is paralleled by utility revenues.

'If rates are increased to take care of higher cost of service, there is usually a similar increase in construction cost and a higher future cost of retirements for which the increased revenue provides. In the whole, therefore, percentages of revenue tend automatically to adjust retirement reserves to retirement needs.'

(f) In this connection it has been further suggested (and the applicant understands the law to be) that the Commission does not have the constitutional right to require the company in the management of its properties to incur the burdensome expense necessary to make the studies and supply the estimates and supporting data as to future depreciation percentages that have been ordered furnished in this independent proceeding.

"Companies such as this applicant do not have even for normal times, data readily available or experience sufficient to make intelligent answers to the questionaire of the Interstate Commerce Commission which is put forward by the Illinois Commerce Commission in this matter, and any answers which this company might make would be merest guesses and of little value or no value in determining what the percentages of depreciation charges should be for any considerable period of time in the future.

"To be of any value whatever, the response of this applicant to these requirements should be made after much detailed study, which would necessarily entail relatively large expense. During these lean years of operation this applicant respectfully requests the Commission not to require, even if it has the right to do so, that companies such as this applicant be put to such expense, and further that the accounts of the company should not be warped out of balance by any order fixing a percentage of depreciation inexorably for any given time.

"A procedure which so circumscribes the officers and directors of a small operating telephone company as to prohibit them from taking note of actual conditions, deprives them of the right of management which is guaranteed to them by the Constitution of the United States. It is well-settled by the decisions of the courts that the commissions have no right to invade the field of management. The reason for

this rule rests fundamentally upon the proposition that the state has not assumed management of telephone properties and is only concerned in obtaining for patrons efficient service at reasonable rates. Any regulation of depreciation charges should certainly not extend beyond this purpose and function of the Commission. All orders of the Commission, therefore, with respect to depreciation charges should allow sufficient flexibility as not to hamper the small owners of telephone property in their efforts to maintain their properties and at the same time render efficient service.

"The company, however, wishes to cooperate with the Commission in every way and stands ready at an appropriate season, when normal times return, to furnish any data, records, memoranda, or any other information which it has available that will assist the Commission in this matter.

"Obviously, it is difficult to the point of impossibility for the Interstate Commerce Commission to hold separate hearings for each of the many thousands of telephone companies in order to come to an adjudication by legal process. This same difficulty, with respect to the several hundreds of telephone companies in Illinois, would face Illinois Commerce Commission, should it undertake to arrive at rates of depreciation through legal process. It appears in conseqence that the Interstate Commerce Commission and now this Commission has sought to shorten this process of official adjudication by getting each company to agree to a basis or starting point and in effect allowing each company to set its own starting point. This seems fair on the surface and undoubtedly no unfairness was intended, but we might as a result have a very awkward consequence for a time, which would result in the case of the applicant running at little or no profit being compelled to either voluntarily set its depreciation at a much lower figure than it could afford over a long pull future, or alternatively it would be obliged to show a bookkeeping loss, upsetting financial arrangements and upsetting dividend flows or payment of interest, etc.

"(g) Because of the prevailing abnormal economic conditions which have embarrassed the telephone industry, particularly the smaller companies, during the past several years, it will be especially inappropriate and burdensome, and in some cases very disastrous, to fix or attempt to fix and apply percentages for depreciation charges that were applicable only, if at all, during normal conditions.

"The percentage of depreciation charges based on operations in normal years are entirely inapplicable under present economic conditions now prevailing, because if applied, such percentages would, as stated above, lead to financial embarrassment in many cases, result in operating deficits and bring about consequent necessity of increasing rates for telephone services—an action which might otherwise be inadvisable at this time and therefore to be avoided.

"The telephone industry has been confronted during the past few years of depression with an experience heretofore unknown to the industry. Since the industry got under way, in about the year 1880, there had been a constant and consistent growth of the telephone business. Operators of telephone property had come to believe that this sort of thing would continue for many years, and all calculations with respect to operating telephone properties were based upon the assumption that such conditions of growth and stability would so continue. The prevailing depression reversed this process, and instead of growth, the companies have, during the past few years, experienced a steady and devastating decline in business. All calculations as to depreciation charges based upon the assumption of continued growth must, therefore, be revised and modified so as to take into account the reverse of these conditions. Flexibility, which formerly was not needed, must now be allowed in connection with fixing these depreciation percentages. Details of setting a percentage for each primary plant account, and in this way arriving at a composite percentage based on the experience entirely different from that now prevailing, are misleading and are liable to result in a warped condition of company accounts.

"(h) Numerous authorities could be cited on various questions at issue in this matter. It is clear that the same rate of depreciation cannot apply alike to all telephone companies. On this question Commissioner Eastman of the Interstate Commerce Commission said, in a report to that Commission:

"'All parties to this proceeding concede that uniform rates of depreciation cannot be established for all telephone companies. There is entire agreement that rates of depreciation for the same classes of property differ materially, depending upon conditions under which the particular company operates, and that if we are to prescribe rates of depreciation, as the statute contemplates, a careful study must be made of the situation of each individual company.'

Also, in the Telephone Depreciation case, reported in 118 I. C. C. 372, Commissioner Eastman said:

"'Upon one proposition all parties are agreed, and that is that the service lives of the same kind of property very widely in different companies. It is impossible to lay down any general rule which will apply in the cases of all companies, owing to the different conditions which surround the use of property in each individual case. . . . There seems, indeed, to be no way in which prospective service life can safely be estimated through an automatic or mechanical process . . . .'

"On the question of the inapplicability of some fixed average to be applied year by year, Mr. Justice Brandeis, in a dissenting opinion in the Baltimore Case, said:

"'And even where it is known that there has been some lessening of service life within the year, it is never possible to entermine with accuracy what percentage of the unit's service life has, in fact, been so consumed. Nor is it essential to the aim of the charge that this fact should be known. The main purpose of the charge is that irrespective of the rate of depreciation there shall be produced, through annual contributions, by the end of the service life of the depreciable plant, an amount equal to the total net expense of its retirement. To that end it is necessary only that some reasonable plan of distribution be adopted. Since it is impossible to ascertain what percentage of the service life is consumed in any year, it is either assumed that depreciation proceeds at some average rate (thus accepting the approximation to fact customarily obtained through the process of averaging) or the annual charge is fixed without any regard to the rate of depreciation.'

"Expert opinions based on other expert opinions and then a composite opinion of them all are of no value in law as evidence, and that is about what the estimates for depreciation come to for small companies. Chief Justice Hughes refers to this matter in the Illinois Bell case, in the following language:

"'Because of the many different classes of plant, some with long and some with short lives, some having large salvage and other little salvage or no salvage, and because of the large number of units of a class, the company employs averages, that is, average service life, average salvage of poles, of telephones, etc. . . .

"'If the prediction of service life were entirely accurate and retirements were made when and as these predictions were precisely fulfilled, the depreciation reserve would represent the consumption of capital, on a cost basis, according to the method which spreads that loss over the respective service but the predictions underlying them are periods. . . .

"'The calculations are mathematical, essentially matters of opinion, that proceed from studies of the 'behavior of large groups' of items. These studies are beset with a host of perplexing problems. Their determination involves the examination of many variable elements and opportunities for excessive allowances, even under an accurate system of accounting, are always present. **The necessity of checking the results is not questioned. The predictions must meet the controlling test of experience.**'

"Mr. John E. Benton, General Solicitor of the National Association of

(*Please turn to page* 34)

FCC Telephone Order No. 10-A Explained

THE United States Independent Telephone Association sent the following self-explanatory letter to its Class A and B members on December 18, 1934:

DEPRECIATION ORDER: If you have not already done so, you will receive from our Washington office a copy of the Federal Communications Commission Telephone Division Order No. 10-A issued on December 13th. A hearing was held on November 16th in response to a request of the State Commissions that there be a postponement of the effective date of the Order and the time extended in which the State Commissions could make recommendations in regard to the percentage rates to be used by Class "A" telephone companies. This Order is the decision of the F. C. C. on that request. It provides that the date when the depreciation rates filed by "A" companies August 1, 1934, will become effective is changed from January 1, 1935 to January 1, 1936. The time within which the State Commissions may submit recommendations, if they desire to do so, is extended to May 1, 1935.

"There is no other change in the Depreciation Order which applies to "A" or 'B" companies. The Class "A" companies are assumed to have filed before August of this year, either direct with the Communications Commission or through State Commissions where those Commissions were willing to act, their estimates of depreciation rates to be charged for their properties. All "A" companies that are subject to the Communications Commission as to reporting and depreciation requirements were required to make this filing. Any such company that did not file by August 1st is in default. There is no change in the Depreciation Order insofar as it applies to "B" companies who are required to file their estimates of depreciation rates by August 1, 1935, which rates will become effective January 1, 1936.

"ACCOUNTING RULES: The Commission has issued a 'Memorandum to Parties of Record' dated December 13, 1934, that no changes will be made in the System of Accounts for Class 'A' and 'B' companies promulgated by the Interstate Commerce Commission in November 1932 and effective January 1, 1933. In December 1932 certain changes were asked in the System of Accounts by the State Commissions, and a hearing was held by the F. C. C. on these petitions on November 16, 1934. The Commission states that it does not consider that there is sufficient time to make the changes and have them become effective January 1, 1935. The Commission states that prior to July 1, 1935 it will arrange for a series of conferences with the State Commissions so that by that date an Order may be issued in regard to changes that will become effective January 1, 1936. Therefore, no changes in the System of Accounts which became effective January 1, 1933 have been ordered or authorized. Please note also that the depreciation accounting procedure required by that System of Accounts is continued in effect, as well as the entire Depreciation Order issued by the Interstate Commerce Commission in July 1931, known as Depreciation Order No. 14700, except the effective date referred to in the previous paragraph of this letter."

FCC Issues Telephone Order No. 10-A

ORDER NO. 10-A

In a regular meeting of the Telephone Division of the Federal Communications Commission, December 13, 1934:

The Telephone Division having under consideration the orders and memoranda heretofore issued by the Interstate Commerce Commission in its Docket No. 14700, Depreciation Charges of Telephone Companies, effective January 1, 1935, and the hearing and argument thereon:

IT IS ORDERED, That the said orders of the Interstate Commerce Commission be, and they are hereby, amended as follows:

(a) By changing the effective dates of said order of July 28, 1931, applicable to Class A telephone companies, from January 1, 1935, to January 1, 1936.

(b) By extending to May 1, 1935, the time within which the State Commissions, if they so desire, may submit original recommendations to this Commission for its consideration in issuing any orders specifying the composite annual percentage rates to be used by Class A telephone companies.

PROVIDED, That the estimates of composite percentage rates submitted by telephone companies to the State Commissions and to this Commission are the information of the several Commissions, but shall not be deemed to be prima facie correct.

PROVIDED FURTHER, That nothing in the foregoing shall be construed as relieving telephone companies from accounting for depreciation by the application to the primary plant account of composite annual percentage rates based upon the best estimates available of service lives and salvage values, as required by the Uniform System of Accounts for Telephone Companies, (First Revised Issue, 1933), unless and until further ordered by this Commission in accordance with the foregoing order.

Accounting Memorandum Issued—Docket No. 2551

In a regular meeting of the Telephone Division of the Federal Communications Commission, December 13, 1934:

The Telephone Division having under consideration the matters presented by briefs and oral argument pursuant to Telephone Division Orders No. 7 and 7-A authorized the following statement:

The Division has considered the matters and things presented, including the question of notice or time necessary under the law prior to the effective date of changes in accounting rules.

The Division is of the opinion, considering all of the facts and circumstances, including the other emergency duties before the Commission, that it will not be practicable to promulgate changes in Accounting Rules for Telephone Companies effective for the year beginning January 1, 1935.

The Division is assured of the fullest co-operation of the State Commissions, and will expect to arrange for a sions, and will expect to ararnge for a series of conferences with the State Commissions, in ample time for the issuance of an order on changes in the Uniform System of Accounts for Telephone Companies prior to July 1, 1935, to become effective January 1, 1936.

Telephone Division's Order No. 6-A

ORDER NO. 6-A

At a regular meeting of the Telephone Division of the Federal Communications Commission, held on the 20th day of December, 1934:

The Telephone Division, having under consideration the returns heretofore made by carriers engaged in telephony subject to the Act, pursuant to Telephone Division Order No. 6, and also having under consideration the provisions of Section 210 of the Act, to regulate the use and issuance of franks and passes, or the granting of free service, or services at less than regular charges, in interstate and foreign communication by such carriers;

IT IS ORDERED, That each Class A Telephone carrier subject to the Act shall, on or before March 1, 1935, make a full and complete response, under oath, in duplicate, to the supplemental form

(*Please turn to page 32*)

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NEWS OF THE MONTH

A dividend of 2 per cent on preferred stock of the Mt. Vernon (O.) Telephone Corp. was paid last month. The dividend, the first paid by the company in two years, amounts to about $6,000.

Cumberland Telephone Co., Harlan, Ky., was incorporated for $5,000. by E. H. Mould, A. S. Mould and W. Mould.

The board of directors of the Platteville, Rewey & Ellenboro Telephone Co., Platteville, Ia., declared an annual dividend, $10 per share on stock par value $20. A committee was appointed to organize plans for a new telephone exchange to cost with exchange equipment $17,000. The work of constructing the new exchange will be started early next spring.

Articles of incorporation, contracts and by-laws, incorporating the Milwaukee Rural Telephone Association, Owatonna, Minn., have been drawn up. Officers named for the coming year are: C. H. Markytan, president; Robert Pichner, vice-president; George Belina, secretary; John Pichner, treasurer, and John Dusek, director, all re-elected; and John Helms, Louis Deml, William Neigebauer and Joseph Pavek, directors for one year.

The Minnesota railroad and warehouse commission has authorized the Buffalo River Telephone Co. to sell a section of line in Moorhead to the Northwestern Bell Telephone Co.

Fred E. Freers of Marion, Ill., has taken up his residence in Kewanee, Ill., and assumed district mangership of the Illinois Commercial Telephone Co. and local managership for Kewanee.

Announcement has been made that subscribers of New Jersey Bell Telephone Co. who had paid the monthly charge for hand-set telephones for 36 months would be relieved of the assessment under a tariff to be filed by the company with the Public Utility Commission.

Fielding L. Williams has been appointed receiver for the Virginia Telephone Co. following the filing of a bill of complaint by the American Office Building Corp. and the Chesapeake & Potomac Telephone Co. The plaintiffs alleged in the bill that the defendant is in default in the payment of its debts; that its assets are of uncertain and doubtful value; that the company is insolvent and its assets should be administered and applied to the payment of its creditors.

The Langlade Telephone Co., Antigo, Wis., has issued its regular preferred stock dividends of 3½ per cent.

Secretary J. W. Williams of the Mississippi Railroad Commission announced that hearing on a citation against all telephone companies in Mississippi, to show cause why they should not reduce local exchange rates, was to have been held January 15. Mr. Williams said that T. P. Goodwin, Jackson rate expert, who has been retained to make a survey of telephone properties and rates, has started work and will have a report ready by that time. The citation, originally made returnable in October, has been continued to permit the state and telephone companies to prepare data.

First round for lower telephone rates in Oklahoma was lost by an order of the majority of the state corporation commission denying the application for a reduction in Tulsa.

John P. Boylan, president of the Rochester (N. Y.) Telephone Co., has been elected president of the Rochester Chamber of Commerce. Mr. Boylan also is president of the Rochester Community Chest, the Rochester Telephone Realty Corporation and of the Up-State Telephone Association. In addition he is a director of the Lincoln-Alliance Bank and Trust Company, Rochester Gas and Electric Corporation, Automobile Club, Red Wing Baseball Club, Mechanics Institute and other institutions and clubs.

At the annual directors' meeting of the Butler-Bremer Mutual Telephone Co., Plainfield, Ia., the following officers were elected for the coming year: S. B. Whitney, president, Wm. Waltemate, vice-pesident, J. K. Lynes, secetary, Farmers State Bank, Plainfield, treasurer. Henry Thompson, who has been the manager for the past three years, was reappointed for the coming year.

Basic Telephone Electrical Theory

(*Continued from page* 15)

voltage creating it. This opposing voltage is known as the counter voltage (or counter e. m. f.) and it tends to impede the flow of AC current through the inductance. As stated above this retarding effect of an inductance coil is known as "inductive reactance" and is expressed in ohms.

The inductance of a coil is proportional to the number of turns, diameter of coil, and permeability of the core. Increasing any one of these factors will increase the inductance. The unit of inductance is the **henry,** and is defined **as the inductance of any circuit in which a current changing at the rate of one ampere per second will induce one volt in the circuit.** This unit is represented symbolically as **L.** Fig. 8 illustrates the effect of inductance in an AC circuit.

The retarding effect of an inductance to any alternating current wave is not a fixed quantity but depends on the frequency of the impressed wave. The inductive reactance expressed in ohms of any inductance to alternating currents of known frequency is equal to the inductance in henries times 6.28, times the frequency. This is expressed in equation form as follows:

$$X_1 = 6.28\ f\ L$$

Where: X_1 = inductive reactance
f = frequency in cycles
L = inductance in henries

It should be particularly noticed that the inductance is a fixed property of any coil, where **the inductive reactance varies with the frequency.**

To illustrate the use of the above equation let us determine the inductive reactance to a 60 current of a coil having an inductance of one henry. $X_1 = 6.28\ f\ L = 6.28 \times 60 \times 1 = 376.80$ ohms.

It is but seldom that the practical man is called on to compute the inductance of coils, but where this is necessary equations such as the following may be used.

$$L = \frac{N^2 \times 3.192u}{1\ 10^8}$$

Where: L = inductance in henries
s = cross section of core in square inches
l = length of coil in inches
u = permeability.

The above formula is useful for designing coils where the length is not more than several times the diameter and where the number of layers of wire on the coil are few. The equation may be transposed to a more useful form as shown below.

$$N = \sqrt{\frac{10^8\ 1\ L}{3.192\ su}}$$

Where:
N = Number of turns.

The following example illustrates the use of this equation. How many turns are required for a coil 2 inches in diameter, 10 inches long, and having an air core, and which must have an inductance of 0.25 henry?

$$N = \sqrt{\frac{10^8\ 1\ L}{3.192\ su}} = \sqrt{\frac{100{,}000{,}000 \times 10 \times 0.25}{3.192 \times (2^2 \times 0.7854) \times 1}} = 5000 \text{ turns}$$

(To Be Continued)

The executive committee of the Minnesota Telephone Association has selected the Lowry Hotel, St. Paul, for its 25th annual convention which will be held on Tuesday, Wednesday and Thursday, January 29, 30 and 31.

Applications for telephone engineer and telegraph engineer positions of various grades in the Federal Communications Commission must be on file with the U. S. Civil Service Commission, Washington, D. C., not later than January 30, 1935.

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"The first to produce a successful vibrating type ringing converter to operate from alternating current."

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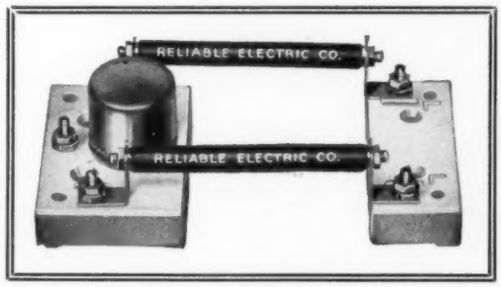

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Multi-Meter For The Telephone Man

(*Continued from page* 14)

button, note the needle climbs to 150; 200; 250; it is going on up, not steady, but in jerks, this indicates the transmitter is not only a "battery-eater" but also is "noisy." Replace the transmitter with a new one (made by the original manufacturer of the set) then check it. Note the needle makes a steady climb to say 150; 200 or 225 (depending upon the make of telephone) then starts dropping back, finally coming to rest at say 100 or 150, providing you have not been jarring the telephone or making much noise in the room. Now speak into the transmitter, use a firm tone of voice, lips just clearing the mouthpiece—the proper way to talk. Say "Bulletin"—note how the meter needle follows every fluctuation of the voice, the current dropping low on some notes and climbing on others. *We are not guessing now on that transmitter.* WE KNOW why Smith's set was noisy and used dry cells fast.

Let's go over the rest of the set while here. It is a 5-Bar, 2,500-Ohm according to the markings. Disconnect the line wires. Set our meter switches to "AC" and "V", throw in our Artificial Line Switch, connect the test leads to the set's Line Posts. No, it does not matter which lead to which post—we are checking A.C. output at voice frequency, so to speak. Hold the receiver against the transmitter mouthpiece, press the meter 6-V button. With two fresh cells and a modern efficient transmitter the meter needle should swing to at least 3-Volts (or, if you prefer, Plus 4-DB) and hold there as long as the receiver is held against the mouthpiece. Incidentally the distance the receiver is held from the mouthpiece will give you the degree of sensitivity of the transmitter. If we did not get the above reading, we then would have to check the receiver, perhaps the diaphragm is bent, rusted, too close or too far from the polepieces. Likewise lightning may have damaged the induction coil—our ohmmeter would quickly tell us. When you get the desired reading, remove finger from the 6-V Button, hang up the receiver and turn the generator crank, that knife-edged pointer on the meter should now show, with steady turning of the crank—at normal ringing speed, 50 to 60-volts A. C. (300-V. Scale). If it does not, then back to the ohmmeter and check the resistance of the armature. If it agrees with the catalog rating, your trouble is due to weak generator magnets.

How about the ringer? All right check it! The ohmeter shows very close to 2,500-ohms—but, check each coil. One reads 1,300 and the other 1,500. Undoubtedly one coil has shorted turns and the other has developed a high resistance where the fine wire is attached to the terminal. Get a new ringer from the truck, test it before you put it in service. Not only for D. C. Resistance but also for its A. C. Resistance the important item if we wish to avoid transmission losses. Use Bill Smith's "110-Volt 60-Cycle House Circuit", set switches for "AC" "IMP" (Never for AC Res.) stick the meter plug into a light outlet, select the meter range desired, short the test leads and turn the "IMP ADJUST" knob until full scale deflection is obtained, then connect the test leads to the ringer terminals.

The 2,500-ohm ringer should give you at least 20,000 to 22,000-ohms A. C. Resistance. Disconnect meter, install ringer and adjust according to that particular manufacturer's instructions. Connect up the telephone and try it out! Central gets you "Just fine now", you hear her splendid and Smith says: "Those bells never did ring in that clear before."

Back in the shop test several telephones—of each make—known to be good, use the average of the readings obtained as a basis for future tests. Your Radio Friend does the same He knows that for certain line voltages etc., just what readings to expect for certain sets, tubes, etc. Try common battery sets on various loops ranging from zero to your longest, insert a Two-Mfd. Condenser in one meter test lead, connect to one of the C. B. sets line posts, the other meter lead to the remaining post when testing. Test any new equipment. Manufacturers can make mistakes and parts get damaged in shipment. Know exactly what you are putting into your sets, your lines, your cord circuits. Know what loss you are creating. See definitely what gain you make when you weed out bad spots. The meter test is more reliable than the human ear—no two people hear alike. Meter testing means working to a fixed standard—you are really testing not guessing! It is a well-known fact a meter will show a gain or loss of many points before the ear can detect any change in volume.

Previous articles in TELEPHONE ENGINEER have fully covered testing with rectifying type meters; the use of a thousand-cycle oscillator for matching impedances; cross talk and line unbalance. Dig out your files, review the articles, follow the simple instructions given in the manufacturers' Telephone Service Meter Bulletins—then note the big improvement in your exchange.

The writer will be glad to answer inquiries regarding this new test set.

FCC Telephone Order 10-A Explained

(*Continued from page* 28)

questionnaire attached hereto and made a part hereof, for the period January 1, 1934 to December 31, 1934.

IT IS FURTHER ORDERED, That effective January 1, 1935, all Class A telephone carriers subject to the Act, shall keep their records in such manner as will enable them to furnish the Commission with the information requested in said form questionnaire for any month or months, subsequent to December, 1934, as may be requested by the Commission.

IT IS FURTHER AGREED, That all Class A telephone carriers subject to the Act, shall retain in their possession all original records containing the data used in compiling the response to the said form questionnaire, until such time as this Commission shall specifically authorize the destruction thereof.

FCC Releases General Order No. 9

GENERAL ORDER NO. 9

At a General Session of the Federal Communications Commission held at its office in Washington, D. C., on the 14th day of December, 1934:

The Commission having under consideration the matter of the requirement that every common carrier shall file with the Commission schedules showing all charges for itself and its connecting carriers pursuant to the provisions of Section 203 (a) of the Communications Act of 1934, or changes made in such charges under Section 203 (b) of said Act; and it appearing that statements of proposed "minimum and other rates" are required to be shown in response to the Commission's forms of Application for Radio Station License, and of Application for Radio Station Construction Permit:

IT IS ORDERED, That such statements of "minimum and other rates" required by the Commission's forms of Application for Radio Station License, and of Application for Radio Station Construction Permit, or other similar statements submitted pursuant to any form of questionnaire now or hereafter required by the Commission in executing its duties under the law shall not be construed as a filing of schedules of charges within the meaning of Title II of the Communications Act;

PROVIDED, That nothing herein contained shall operate to relieve any carrier from its duty under the Act to file schedules of charges, and changes made in such charges in compliance with Section 203 of the Act.

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With a Master 7 a lineman carries a smaller and more convenient tool—but one that will do as much as any other 8-inch because of the multi-power head—a stronger and more durable tool—better balanced and handier working—easier on the wrists—greater power—and, in ordinary use, unbreakable. An all-around, fine article, in which there is continued pride of ownership and consequently an inclination to treat it as a plier should be treated.

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Pliers

Over One Million in Use

Do YOU buy pliers for these 2 REASONS ?

VACUUM GRIP LINEMAN PLIERS
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Name etched FREE on handle of each pair.

THERE are just two reasons for giving preference to one make of tool over another make—greater efficiency and greater economy. Judged on these two points, Vacuum Grip Lineman Pliers stand alone.

Their design, finessed to the Nth degree, adds skill and speed to the lineman's hand. The super-margin of strength built into them from tip to tip, gives them a useful length of life far in excess of ordinary pliers.

A simple running test will prove our claims. Write us today for prices on lots of one-half-dozen or more, and details of our Demonstration Trial Offer.

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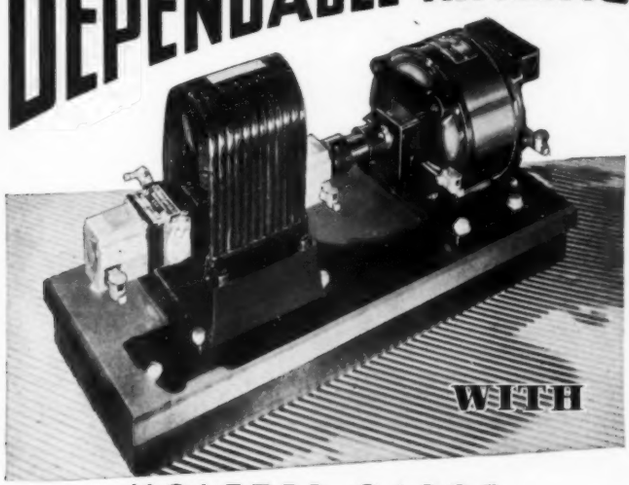

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Sturdy Construction for life-time service.
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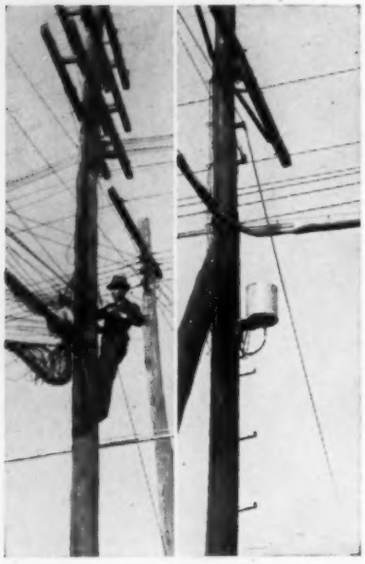

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Suspension of Depreciation Order Asked

(*Continued from page 27*)

Railroad and Utilities Commissioners, in his argument before the committees of Congress, with respect to the Federal Communications Bill, stated:

"'Accurate determination of the proper amount to be allowed for depreciation can only be determined in a particular case by careful investigation such as is made in a rate case.'

"Then again he said:

"'In every rate case any Commission should give consideration to the value of property and give consideration to how much should be allowed in the way of a fair rate of return and how much should be set aside for depreciation, as new questions to be determined upon the evidence of the particular case at the time of the determination of the case.'

"General Order 137 of Illinois Commerce Commission seems to be based upon the assumption that the theory of depreciation charges adopted by the Interstate Commerce Commission in its order of July 28, 1931, is correct and is applicable to small companies as well as large, and is, therefore, to be followed blindly without consideration at the hands of Illinois Commerce Commission and without giving companies subject only to the jurisdiction of the latter commission an opportunity to present at a hearing their views as to whether this theory of depreciation should be adopted.

"Applicants asserts that this theory should not be adopted with respect to small companies; that it is inapplicable to them for the reasons stated herein, and that its application to them may well be disastrous to them, and that it would in any event be unfair and unjust to either the company or to its patrons. Applicant further asserts that Section 14 of the Illinois Commerce Commission Act giving Illinois Commerce Commission authority to determine and fix rates of depreciation for utilities subject to said Commission's jurisdiction does not require that said depreciation rates be determined and fixed at a time other than the time rates for service are investigated or fixed, and that in fact the 1933 amendment to said act requiring that the Commission allow reasonable deductions for depreciation at the time rates for service are investigated or fixed not only implies that the depreciation rates are to be fixed at that same time, but also makes it necessary that rates of depreciation be examined into at that time. It is clear, therefore, that it is an unnecessary and consequently a wasteful and expense duplication of effort to require that rates of depreciation be fixed at any other time. Applicant further asserts that even if it were desirable for any reason to determine and fix depreciation rates at a time

(*Please turn to page 35*)

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Telephone Linemen Find the Model A COFFING HOIST Invaluable for Pulling Guy Wires, Messengers, Underground Cables, etc.

The Model A COFFING HOIST only weighs 14 pounds, is rated at ¾ ton and tested to 100% overload. Also made in 1½, 3 and 6 ton sizes. We manufacture a variety of line equipment. Catalog furnished upon request.

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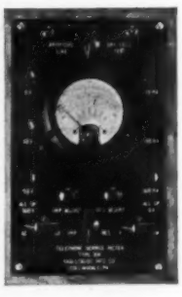

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D.C. Current 15 M.A. to 6 Amperes
Resistance .5 to 50,000 ohms
Inductance, Capacity and Continuity

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RAMBLEGRAPHS

By J. A. Smith

Passing through Kentucky Rambler stopped for a visit with the Lexington Telephone Co., where he renewed acquaintance of N. B. Shely whom we had met at the organization of the new state association at Louisville. Found an excellent exchange ably managed with a corp of enthusiastic workers. It is a genuine pleasure to visit a city whose telephone building and service find recognition and favorable comment with its patrons.

* * *

At the Charleston, W. Va., organization meeting Rambler continued to meet friends of his publication. G. E. Todd, manager of the United Farmers Telephone Co., of Cameron, W. Va., told of the growth of his company and how he met the problems confronting him during the past few years. Said he was going right along with construction work, was buying a car of poles to replace the old and for further construction.

* * *

Whiled away Armistice Day in New York by driving to Asbury Park, N. J., and looked over the wreck of the Morro Castle, huge passenger ship recently burned off the coast of that little city. Certainly a crime to let people perish in sight of land on a ship of this size without even lowering the lifeboats.

* * *

Raced across the mountains of Pennsylvania in an effort to beat the threatened snowstorms prevalent in that section in November. Missed most of the snow and arrived at home for turkey day, where we hope to remain the most of the winter. Be seeing our friends again in the spring.

* * *

Rambler notes with more than passing interest the success of J. R. Hastie, former vice-president and advertising manager of Telephony Publishing Co., in the insurance field which he entered in 1926 after rounding out thirteen years with the above publication. Hastie was an immediate hit in his new profession arising to the position of assistant manager of one of the leading agencies in Chicago. Recently he was named Chicago manager of the Mutual Life Insurance Co., succeeding R. E. Spaulding who retires.

* * *

Hastie has made an available reputation in the insurance field. just as he did in the telephone industry; as an insurance salesman he has won a number of prizes for leadership. As a public speaker he won admiration of his coworkers, both in the United States and Canada. John Hastie forged to the front through ability and personality, and his many friends in the telephone industry will be glad to know of his unprecedented success in the insurance game.

A gentleman who stated he was manager of a mutual telpehone company, recently told us his company was only charging 25 cents per month for service and that they had a good sum laid aside as surplus. He admitted there were no salaried men in his organization and that it was not operated for profit.

Suspension of Depreciation Order Asked

(*Continued from page* 34)

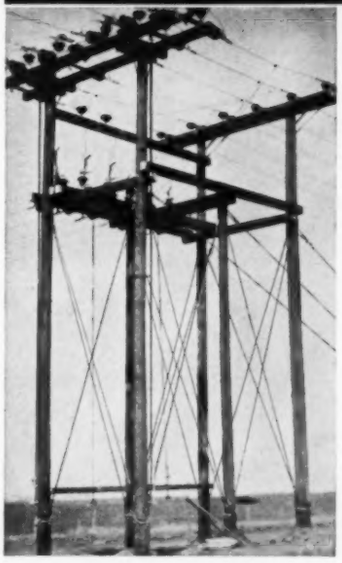
other than that when rates for service are investigate or fixed, it would be impracticable to do that now because of the present unprecedented situation of the telephone industry caused by the depression, and the consequent and obvious uncertainties of the future with respect to said industry.

Western Electric Sales

Sales of Western Electric Co. for 1934 will be about $90,000,000 compared with $69,500,000 in 1933. Further improvement is anticipated in 1935.

Crapo GALVANIZED PRODUCTS

INDIANA STEEL & WIRE CO. Crapo Galvanized MUNCIE, IND.



Made to Surpass Rigid Specifications

Crapo Galvanized Seven-Wire Steel Strand combines every element essential to dependable, economical line construction and maintenance. The non-cracking, non-peeling *pure* zinc galvanized coating guarantees maximum resistance to corrosion. Proper ductility makes the strand easy to serve. Correct tensile values insure more than ample strength for guys and spans.

These factors are scientifically controlled in all *Crapo* Galvanized Products by vigilant laboratory supervision over each step in manufacture.

You can depend upon genuine *Crapo* Galvanized Steel Strand and Wire to more than meet the most exacting specifications.

Indiana Steel & Wire Co.
Muncie, Indiana

(*Left*) Switching station, Northwestern Public Service Co., Huron, South Dakota. Guyed with *Crapo* Galvanized Seven Wire Steel Strand.

Steel Strand

• • •

Telephone and Telegraph Wire

The Clearing House

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The
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POSITION WANTED

By a telephone man with 10 years' experience in manufacture, installation and maintenance of toll, manual, PBX step-by-step and panel dial systems in the Bell Company. Also 5 years' office and sales experience. Married. Age 35. Will go anywhere. Write D. R. D., c/o Telephone Engineer.

Thomas A. Watson Dies

Dr. Thomas A. Watson died at his winter home in Florida on December 14. Dr. Watson collaborated with Dr. Alexander Graham Bell in the invention of the telephone and with his own hands made the first telephone instrument. On March 10, 1876, he heard the first words ever uttered over a telephone when Dr. Bell called, "Mr. Watson, come here, I want you."

Dr. Watson was a thinker, inventor and scientist. His experiments were largely along electrical lines but a steam engine he built was the beginning of the largest ship building plant in the United States. He was also greatly interested in drama and art.

U. S. Rubber Appoints

Appointment of Harry M. Green as manager of mechanical goods sales, Pacific Coast Division, which is comprised of the Los Angeles, San Francisco, Portland, Seattle and Salt Lake City branches, has been announced by H. A. Everlien, sales manager, mechanical goods division, United States Rubber Products, Inc.

Weston Bulletin

Weston Relays is the title of a new, 12-page bulletin now being distributed by the Weston Electrical Instrument Corp., Newark, N. J. On its pages are grouped comprehensive lines of sensitive, toggle, polarized, power and time delay relays. The bulletin might well be termed a complete summary of over 30 years experience in the development and manufacture of relays. Copies are available by writing the Weston Corporation at Newark, N. J.

HELP! HELP!

We will give 3-year subscriptions to **Telephone Engineer** to anyone who can furnish us a complete file of **Telephone Engineer** for—

(1) **January to June, inc.—1917**
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- HI-VOLT. LITTELFUSES for transmitters, etc., 1,000 5,000, & 10,000 volt ranges, 1/16 amp. up.
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For the convenience of readers of Telephone Engineer

A Statement of Facts

Above is an unretouched photograph of a telephone we re-manufacture for our customers for as low as $7.50 each. Our customers supply raw metal parts which we use in place of new castings and machinings. Otherwise, this telephone is manufactured like any other brand new telephone. The engineering on it is correct.

See Page 7 of our Catalog No. 35, or write direct, for details of how you can use this manufacturing service.

SUTTLE EQUIPMENT COMPANY
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W. L. Runzel, President, brings to this organization 44 years' experience in the manufacture of this type of telephone equipment.

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Book Review

"OUR LOONEY LIBERALS"

By FRANK McKINNEY
$1.50 Per Copy

"Grant the Radicals six years of supremacy, and our rich will disappear, our middle classes will be submerged, and at least one-third of the total population will die of hunger and violence.

"Those persons remaining alive at the end of such a period would find themselves slaves in a miserable land devoid of culture, and filled with viciousness, ignorance and unbridled barbarism."

So thinks the author of "Our Looney Liberals," who has written this book with the idea of giving his readers a glimpse at the predatory rabble and the shallow minded theorists, whom he depicts as the motivating forces of the liberal-radical movement.

The Author brings to his task of codemning radicalism, and defending conservatism, an intimate acquaintance with liberal-radical and conservative groups. As a reporter, legislative correspondent, city editor and business executive, he has mingled and lived on friendly terms with all classes of men. Neither an aristocrat nor a radical himself, he has surveyed present day trends as an observer, and reports his findings as presented in "Our Looney Liberals."

Adds to Equipment

An order has recently been received by Stromberg-Carlson for rehabilitating equipment for the Vandergrift Telephone Co., Vandergrift, Pa. The local positions of the main switchboard are to be entirely revamped.

Install Kellogg Boards

The Wattsburg Telephone Co., Wattsburg, Pa., recently purchased a new Kellogg No. 50 magneto switchboard to replace its old equipment. H. J. Gifford is president of the company.

The Calendar Mutual Telephone Co., Calendar, Ia., also recently purchased a new Kellogg 150 line magneto switchboard.

Coils Rewound

We save you almost half the price of new coils.

Ringer coils, induction coils and drop coils.
Generator armatures.

You will be surprised how well we do it.

Buckeye Telephone & Supply Company
COLUMBUS, OHIO

DILLON Temperometer

Registers correct working temperature of wiping solder. Good joints depend on correct solder temperature.

PROOF!

"We have purchased a DILLON TEMPEROMETER for our cablemen and the instrument is working fine."
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Rio Grande Valley Telo. Co.
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Dillon Mfg. Co.
63 E. LAKE ST. CHICAGO

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